REMARKS

Claims 1, 6-10, 14, 16, 17, 23, 25, 30, 36, 44, 45, and 46 have been amended.

Claims 3, 15, 26, 27 and 31-35 have withdrawn.

Claims 4, 5, 11-13, 18, 28, 29, and 40 have been cancelled without prejudice with respect to future filings.

New Claims 47-60 have been added.

Claims 1, 36, 45, 46, and 48 are in independent format.

1. Rejections Under 35 U.S.C. § 102(b)

A. Claims 1, 2, 4-8, 14, 16, 19, 21, 23, and 28-30

Claims 1, 2, 4-8, 14, 16, 19, 21, 23, and 28-30 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Published Application No. 2002/0018218 to *Conheady*.

Claims 4, 5, 28, and 29 have been cancelled, and accordingly, the rejections thereof are rendered moot.

The '218 *Conheady* application is directed towards a method and an apparatus for optically *scanning* a vehicle wheel. A beam of structured light emitted by a moving light source (6) is reflected off a wheel surface to a "position-sensitive receiver" (7) which is mounted to move in unison with the structured light emitter. Using trigonometric calculations (See: Para. [0003]), the distance between the point of beam reflection on the wheel surface and a reference location is measured using a constant relationship between the light emitter, the "position-sensitive receiver", and a pixel location on the receiver which is maximally illuminated by the reflected light. (See: Para. [0030]). To generate a profile of the wheel surface, the beam of structured light is

"scanned" across the desired profile in a stepwise manner by concurrently moving the light emitter and receiver with a stepping motor (See: Para. [0031]). A sequence of distance measurements are acquired from the associated change in position of the observed bright spot (maxima of luminous intensity) of reflected light on the surface of the "position-sensitive receiver". (See: Para. [0032]).

In simple terms, the '218 *Conheady* application discloses a conventional system which determines a distance measurement by identifying the point at which a reflected beam of structured light intersects an optical sensor array. The light source and the sensor are maintained in a fixed relationship. Hence, changes in the position of the point on the sensor (determined by the luminosity maxima) as the beam of light is scanned across a surface by changing the orientation of the emitter/sensor assembly correspond to changes in the geometric relationship between the light source, the surface, and the image sensor. With the light source and image sensor held in a fixed relationship, the only variable is the location of the surface onto which the light beam is projected, hence changes in the position of the point on the sensor surface correspond to a change in distance between a single point on the surface (at which the light beam is reflected) and a known reference point.

The MPEP at §2131 provides:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required in the claim.

The '218 *Conheady* application fails to anticipate independent Claim 1, as amended, because it does not expressly or inherently describe a vehicle service system having an imaging sensor assembly disposed to acquire an image of a portion of the vehicle wheel assembly, which is composed of a two-dimensional array of pixels, and where the central processing unit is configured to determine a distance measurement associated with the vehicle wheel assembly using the acquired image. Instead, the '218 *Conheady* application teaches a system configured to identify a sequence of discrete luminosity maxima points on a CCD sensor, each associated with a different alignment of a scanning light beam, to generate a corresponding sequence of distance measurements between a single point on a reflective surface and known reference point.

Accordingly, the '218 *Conheady* reference fails to completely disclose all of the elements of independent Claim 1 and associated dependent claims 2, 6-8, 14, 16, 19, 21, 23, and 30. Hence, these claims are seen as allowable under 35 U.S.C. § 102(b).

With further respect to Claim 14, the '218 *Conheady* reference fails to disclose a vehicle wheel service system configured to utilize distance information to identify mis-centering of a vehicle wheel rim on a rotational support structure. Paragraph [0004], cited by the Examiner in support of such disclosure, addresses only the illumination of a point on a wheel rim by a light beam to facilitate the placement of a balancing weight, and does not describe wheel centering.

B. Claims 36-39 and 41-44

Claims 36-39 and 41-44 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,054,918 to *Downing*.

The '918 *Downing et al.* reference fails to anticipate independent Claims 36 or 44, as amended, in much the same way the '218 *Conheady* application fails to anticipate the claims discussed above. The '918 *Downing et al.* reference does not expressly or inherently describe a vehicle service system having an optical energy sensing means configured to receive reflected optical energy and to generate a corresponding image consisting of a two dimensional array of image pixels and associated distance data, as required by Claim 36. The '918 *Downing et al.* reference does not expressly or inherently describe a method for measuring features of a vehicle wheel assembly which includes the steps of generating a two-dimensional image of a three-dimensional area on the vehicle wheel assembly from the detected optical energy, as required by Claim 44.

Instead, the '918 *Downing et al.* reference teaches a system configured to observe a line of light structured projected as a stripe onto the surface of interest on a vehicle wheel. The line of structured light illuminates individual pixels of an optical sensor, as shown in Fig. 10B, to produce a contour of the vehicle wheel surface of interest, along the illuminated line. By using the identified two-dimensional coordinates of each pixel illuminated by the line of light, the '918 *Downing et al.* reference teaches to use coordinate transformations to subsequently determine three-dimensional information associated with illuminated contour of interest. (Col. 8, line 61 – Col. 9, line 12). In simplified terms, the position of an illuminated pixel on the two-dimensional imaging array in the '918 *Downing et al.* reference is processed using the known configuration of the camera and light source to identify a corresponding three-dimensional position of that point along only the illuminated contour on an wheel

surface. No information is calculated, acquired, or determined for pixels on the imaging array which are not illuminated by the reflected line of structured light, and an image is not produced of any portion of the vehicle wheel assembly which is not illuminated by the structured light line. In contrast, the apparatus of the present invention acquires an image of a surface region of the vehicle wheel assembly, which is not limited to a specific illuminated line or point.

Accordingly, the '918 *Downing et al.* reference fails to completely disclose all of the elements of independent Claims 36 and 44, and associated dependent claims 37-39 and 41-43. Hence, these claims are seen as allowable under 35 U.S.C. § 102(b).

C. Claim 45

Claim 45 has been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,054,918 to *Downing*.

The '918 *Downing et al.* reference fails to anticipate the claim. The reference does not expressly or inherently describe a method for selecting imbalance correction weights for a vehicle wheel assembly in which a indicator, which may be a device such as a wand, or simply be the operator's finger, is *first* positioned within the field of view of an imaging sensor, at a location on a vehicle wheel rim *where an operator desires to place an imbalance correction weight*, and which second, acquires and processes an image of the indicator at the desired location to (a) *identify the desired location* on the wheel rim, and (b) calculate an imbalance correction weight amount which would be required to correct a wheel imbalance if placed at the desired location.

Rather, the '918 *Downing et al.* reference discloses at Col. 3, lines 10-50, a simplistic wheel balancing system which employs optical imaging to identify the wheel

rim inner and outer rim position locations, so that the balancing system can calculate imbalance correction weight amounts and placement locations *for an operator*. The '918 *Downing et al.* reference does not teach any method for wheel balancing which would allow an operator to initially indicate a desired weight placement location, identify the desired location in an image, and subsequently calculate an imbalance correction weight amount suitable for placement at the indicated location.

Accordingly, the '918 *Downing et al.* reference fails to completely disclose all of the requires steps of independent method Claim 45, and the claim is seen as allowable under 35 U.S.C. § 102(b).

2. Rejections Under 35 U.S.C. § 103(a)

A. Claims 9 and 10

The rejection of Claims 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,337,581 to *Eck* is respectfully traversed.

The Examiner states that while the '218 *Conheady* reference fails to show a vehicle service system configured to calculate wheel assembly parameters including the bead seat surfaces of the vehicle wheel rim and lateral runout of the vehicle wheel rim, the '581 *Eck* reference teaches a targeting structure for use with an *alignment apparatus* that can determine tire bead seat surfaces and lateral runout, citing Col. 8, lines 45-65. Hence, the Examiner contends it would have been obvious to modify the '218 *Conheady* device to include the parameters discussed in the '581 *Eck* reference.

Amendments to Claims 9 and 10 clarify that the measured parameters, i.e. radial runout of a tire bead seat surface, and lateral runout of a vehicle wheel rim, are *about*

the respective circumferences on the vehicle wheel rim surfaces. Contrary to the Examiner's statements, the '581 *Eck* reference does not teach or suggest measurement of radial runout of about the circumference of a tire bead seat surface of a vehicle wheel rim, or measuring lateral runout about the circumference of a vehicle wheel rim. The '581 *Eck* reference is a vehicle wheel alignment system, and is designed to measure parameters associated with a vehicle wheel assembly *mounted to a vehicle wheel hub.* The procedures described in the passages cited by the Examiner, i.e. Col. 8, lines 45-65, are designed to measure "lateral runout" and "radial runout" of a wheel assembly *mounted to a wheel hub*, as it is rotated about the axis of the vehicle axle. The apparatus used in the '581 *Eck* reference is *fixed* to the wheel rim, and maintains that fixed position throughout the entire measurement procedure. It is incapabale of acquiring measurements *for points about the circumference of the wheel rim.* Rather, the '581 *Eck* apparatus acquires measurements for a single point on the vehicle wheel assembly relative to the axis of the vehicle axle about which the vehicle wheel assembly rotates, i.e. wobble or eccentricity of the wheel assembly due to the mounting to the wheel hub, not variations due to the configuration of the vehicle wheel rim itself.

In the '581 *Eck* reference, the wheel assembly is measured in a first position, and then the entire assembly, including the measurement apparatus, is rotated 180 degrees where a second measurement is acquired. (Col. 8, lines 64-67) If the first and second measurements are not equivalent, then the mounted assembly as a whole is determined to have a measure of "lateral runout" or "radial runout" relative to the axis of rotation. This runout as described in the '581 *Eck* reference is due to a combination of

two components: (1) mis-mounting of the wheel assembly to the hub or loose hub bearings, and (2) any physical deformity of the wheel rim or bead seat *at the position at which the assembly is mounted to the wheel hub.* The '581 *Eck* reference, as a conventional wheel alignment system, is incapable of distinguishing between (1) and (2). Since the runout due to (1) is independent of mounting position of the assembly to the wheel rim, the '581 *Eck* reference assumes that only that type of misalignment can be corrected, and ignores any runout due to (2). (Col. 8, line 68 – Col. 9, lines 3 and 29-31).

In addition to lacking the limitations of the independent parent claim discussed above, the combination of the '218 *Conheady* reference with the '581 *Eck* reference fails to teach or suggest to one of ordinary skill a vehicle wheel service system which is capable of measuring radial runout about the circumference of a bead seat surface (Claim 9), or lateral runout about the circumference of a vehicle wheel rim (Claim 10), independent of the runout caused by the mounting of the wheel assembly to a wheel hub and/or axle. Accordingly, Claims 9 and 10 are seen as non-obvious under 35 U.S.C. § 103(a) over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,337,581 to *Eck.*

B. Claims 11 and 12

The rejection of Claims 11 and 12 under 35 U.S.C. § 103(a) is rendered moot by the cancellation of Claims 11 and 12.

C. Claim 13

The rejection of Claim 13 under 35 U.S.C. § 103(a) is rendered moot by the cancellation of Claim 13.

D. Claims 17 and 18

The rejection of Claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,723,445 to *Ripley* is respectfully traversed.

Claims 17 and 18 have been amended to include the limitations in a single claim.

The Examiner states that while the '218 *Conheady* reference fails to show a vehicle service system configured to identify a wheel spoke configuration or a wheel spoke profile, the '445 *Ripley* reference describes wheel features to include spoke configuration and spoke profile at Col. 2, lines 27-46. Hence, the Examiner contends it would have been obvious to modify the '218 *Conheady* reference to include the identification of these features *because these features are necessary when determining the balance of a wheel.*

To determine the balance of a vehicle wheel assembly, it is *not* necessary to identify wheel spokes or wheel spoke profiles. The balance of a vehicle wheel assembly is a function of mass distribution about an axis of rotation, and not the specific configuration or profile of the wheel spokes. It is well known that vehicle wheels incorporate spokes, and that these spoke have different profiles. The '445 *Ripley* reference at Col. 2, lines 27-46 merely acknowledges this, and provides no teaching or incentive to utilize this information in a vehicle wheel balancing procedure. In fact, the '445 *Ripley* reference actually teaches away from the relevance of spokes and spoke profiles when it states "... it is of no particular significance whether the display is viewable on the outer surface of the disk, on the rim, on a wheel cover, on a hub cap, or on any other similar wheel structure."

Since the '445 *Ripley* reference is, in fact, directed towards providing a visual display of tire pressure information on an exterior surface of a vehicle wheel, and it does not address the identification of wheel spokes or spoke profiles, the combination of the '445 *Ripley* reference with the '218 *Conheady* reference fails to teach or suggest to one of ordinary skill in the art the identification of wheel spoke configurations or wheel spoke profiles from visually measured distance information acquired by a vehicle wheel service system. Furthermore, the '445 *Ripley* reference fails to teach or suggest modifications to the teachings of the '218 *Conheady* reference which would render obvious the missing limitations required by the independent parent claim, discussed above.

Accordingly, amended Claim 17 is seen as non-obvious under 35 U.S.C. § 103(a) over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,723,445 to *Ripley.*

E. Claims 20 and 22

The rejection of Claims 20 and 22 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 5,054,918 to *Downing* is respectfully traversed.

As previously discussed above, neither the '218 *Conheady* reference nor the '918 *Downing* reference describe a vehicle service system having the limitations of independent Claim 1, from which Claims 20 and 22 ultimately depend. Hence, the combination of the '218 *Conheady* reference and the '918 *Downing* reference fails to render obvious an imaging sensor assembly disposed to acquire a two-dimensional optical image (as distinguished from a point source reflection or contour line) of a

portion of the vehicle wheel assembly, where the optical image consists of a two dimensional array of pixel elements, and where the central processing unit is configured to use the image to determine a distance measurement associated with a portion of the vehicle wheel assembly.

Accordingly, Claims 20 and 22 are seen as non-obvious under 35 U.S.C. § 103(a) over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 5,054,918 to *Downing.*

F. Claim 24

The rejection of Claim 24 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,584,469 to *Lovalenti* is respectfully traversed.

The Examiner states that while the '218 *Conheady* reference fails to show a vehicle service system configured to identify a wheel rim surface defect, the '469 *Lovalenti* reference describes features to include wheel rim surface defects at Col. 1, lines 30-65. Hence, the Examiner contends it would have been obvious to modify the '218 *Conheady* reference to include these features taught by the '469 *Lovalenti* reference *because this feature is necessary when determining the balance of a wheel.*

To determine the balance of a vehicle wheel assembly, it is *not* necessary to identify wheel rim surface defects. The balance of a vehicle wheel assembly is a function of mass distribution about an axis of rotation, and not the specific surface conditions of the wheel rim.

MPEP §2143.01 provides:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F. 2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

The teachings of the '469 *Lovalenti* reference are completely unrelated to the measurement and identification of vehicle wheel rim surface features. The '469 *Lovalenti* reference is related to methods and apparatus for the inspection of *translucent* containers to detect *radially reflective defects*. (Col. 1, lines 6-9). Vehicle wheel rims are not translucent containers (i.e., glass bottles). As such, there is no motivation for one of ordinary skill in the art to combine the '469 *Lovalenti* reference with the '218 *Conheady* reference.

Furthermore, one of ordinary skill in the art would have no reasonable expectation of success with a combination of the '218 *Conheady* reference and the '*469 Lovalenti* reference to provide an apparatus for the detection of vehicle wheel rim surface defects. The passages in the '469 *Lovalenti* reference cited by the Examiner describe methods for detecting radially reflective defects in *translucent containers* (i.e. glass bottles) by transmitting beams of radiant energy *through a container's surface to detect refracted and reflected light from a spot on the container's inner surface.* A vehicle wheel rim is not translucent, and transmitted radiant energy (at least in the visual spectrum) cannot pass through a vehicle wheel rim surface to refract or reflect from a spot on a wheel rim inner surface. Hence, one or ordinary skill in the art would readily recognize that the primary requirement for the operation of the '469 *Lovalenti* reference (i.e. translucent target objects) is not present when seeking to identify surface defects on a vehicle wheel rim, and hence, would have had no reasonable expectation

that use of the '469 *Lovalenti* apparatus in combination with the '218 *Conheady* reference would be successful.

In addition to failing to supply elements missing from the independent parent claim, discussed previously, the combination of the '218 *Conheady* reference with the '469 *Lovalenti* reference fails to establish a *prima facie* case of obviousness with respect to Claim 24. Accordingly, the rejection of Claim 24 as obvious under 35 U.S.C. § 103(a) over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Patent No. 4,584,469 to *Lovalenti* is improper, and should be withdrawn.

G. Claim 25

The rejection of Claim 25 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Published Application No. 2002/0000121 to *Carter* is respectfully traversed.

As previously discussed above, the '218 *Conheady* reference does not describe a vehicle service system having the limitations of independent Claim 1, from which Claim 25 depends. These missing limitations are not found in the '121 *Carter* reference. Hence, the combination of the '218 *Conheady* reference and the '121 *Carter* reference fails to render obvious an imaging sensor assembly disposed to acquire a optical image (as distinguished from a point source reflection) of a portion of the vehicle wheel assembly, where the optical image consists of a two dimensional array of pixel elements, and where the central processing unit is configured to determine distance measurements associated with the vehicle wheel assembly from the acquired image.

Accordingly, Claim 25 is seen as non-obvious under 35 U.S.C. § 103(a) over U.S. Published Application No. 2002/0018218 to *Conheady* in view of U.S. Published Application No. 2002/0000121 to *Carter.*

H. Claim 46

The rejection of Claim 46 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,054,918 to *Downing* in view of U.S. Published Application No. 2002/0000121 to *Carter* is respectfully traversed.

As amended, Claim 46 requires the steps of positioning, within the field of view of an imaging sensor assembly, an indicator at a desired location on a vehicle wheel rim of the vehicle wheel assembly for placement of at least one imbalance correction weight. Once the indicator is placed, an image of the indicator is acquired with the imaging sensor assembly, and the acquired image is utilized to select an imbalance correction mode. (See: Para. [0087] – [0088]).

The cited combination of the '918 *Downing* reference and the '121 *Carter* reference fails to render Claim 46 obvious to one of ordinary skill in the art, as neither reference teaches or suggests the selection of an imbalance correction mode of operation for a vehicle wheel balancing system using acquired images of weight placement location indicators. Accordingly, Claim 46, as amended, is seen as non-obvious under 35 U.S.C. § 103(a) over U.S. Patent No. 5,054,918 to *Downing* in view of U.S. Published Application No. 2002/0000121 to *Carter.*

3. New Claims

New Claim 47 depends from independent Claim 46, and further requires the step of utilizing the acquired image to select an imbalance correction weight type, i.e. clip-on weight or adhesive weight. (See: Para. [0088]).

New independent Claim 48 sets forth a method for guiding placement the of an imbalance correction weight in a vehicle wheel balancing system having an imaging sensor assembly configured to provide dimensional data associated with features in a field of view encompassing at least a portion of a vehicle wheel assembly undergoing a vehicle wheel balancing procedure. The method includes the steps of calculating a placement location for at least one imbalance correction weight on the vehicle wheel assembly, positioning an imbalance correction weight within the field of view of the imaging sensor assembly, acquiring at least one image of the imbalance correction weight within the field of view, and processing said acquired image to provide guidance for placement of said imbalance correction weight at said calculated placement location. (See: Para. [0089]).

New dependent claim 49 depends from Claim 1, and further requires that the imaging sensor assembly be configured to acquire stereoscopic images of the vehicle wheel assembly, as described in the Substitute Specification at Para. [0049].

New dependent claim 50 depends from Claim 1, and further requires that the imaging sensor assembly be configured to acquire distance information for each pixel element in the optical image, as described in the Substitute Specification at Para. [0048].

New dependent claim 51 depends from Claim 16, and clarifies that the identified features include tire surface markings, as described in the Substitute Specification at Paras. [0056] and [0085].

New dependent claims 52 and 53 each depend from independent Claim 1, and require the imaging sensor to acquire distance measurement associated with the acquired image (Claim 52) and with each pixel in the acquired images (Claim 53), as described in the Substitute Specification at Paragraphs [0021] and [0048].

New dependent claims 54-60 are similar to withdrawn Claims 15, 26, 27, and 32-35, respectively, however, they specifically depend from Claim 2, and as such require the limitation of a vehicle wheel balancing system. The specific embodiments of a vehicle wheel balancer system configured with bead rollers for facilitating tire bead breaking are described in the Substitute Specification at Para. [0069] – [0074] and [0081] - [0083], and is shown in Formal Drawing Figure No. 10.

Each of the aforementioned new claims is either generic or drawn to the elected species of a vehicle wheel balancing system, and is believed to be novel and non-obvious over the cited references.

4. Conclusion

If for any reason the Examiner is unable to allow the application on the next Office Action and feels that an interview would be helpful to resolve any remaining issues, the Examiner is respectfully requested to contact the undersigned attorney for the purpose of arranging such an interview.

Respectfully submitted,

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